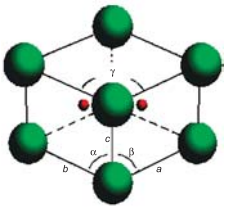
Data, Reference Materials, and Measurement Methods

The Ceramics Division has been a vigorous participant in support of NIST's core mission as a Measurement Standards Institute. The Division has made significant contributions to all aspects of standard reference databases, standard reference materials, and standard measurement methods and practices. As may be observed here, the products established by the Division provide a substantial resource spanning a considerable sector of materials metrology.

DATABASES



Crystallography

NIST principal investigator:
V.L. Karen

NIST Standard Reference Database 15

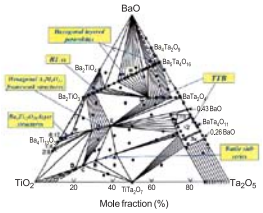
NIST/Sandia/ICDD Electron Diffraction Database. Chemical, physical, and crystallographic information for more than 81,500 materials, including minerals, metals, intermetallics, and general inorganic compounds; the database and associated software enable highly selective identification procedures for microscopic and macroscopic crystalline materials. Available for purchase at **http://www.nist.gov/srd/nist15.htm**.

NIST Standard Reference Database 83

NIST Structural Database. Crystallographic and atomic position information for metallic crystalline substances, including alloys, intermetallics and minerals; the database is distributed in an ASCII format, convenient for reading into a variety of database management systems or processing by independent software routines. Available for purchase at **http://www.nist.gov/srd/nist83.htm**.

NIST Standard Reference Database 84

FIZ/NIST Inorganic Crystal Structure Database, Release 2004/1 (February 2004); produced cooperatively by the Fachinformationszentrum Karlsruhe (FIZ) and NIST; a comprehensive collection of full structural crystallography data of inorganic compounds; contains more than 70,000 entries. Available for purchase at **http://www.nist.gov/srd/nist84.htm**.

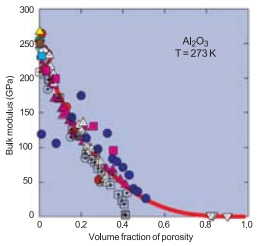


Phase Equilibria Diagrams

NIST principal investigator:
T.A. Vanderah

NIST Standard Reference Database 31

NIST/ACerS Phase Equilibria Diagrams. Produced jointly by NIST and the American Ceramic Society; thirteen regular book volumes, four topical volumes, three annual volumes, and a computerized database on CD ROM; more than 53,000 units have been sold; the current CD contains approximately 20,000 critically evaluated diagrams and 15,000 expert commentaries. (Free demo CD available from NIST.) Available for purchase at **http://www.nist.gov/srd/nist31.htm**.



Materials Properties

NIST principal investigator:
R.G. Munro

NIST Standard Reference Database 30

Structural Ceramics Database. Physical, mechanical, and thermal properties; more than 38,000 numeric values. Available online at **http://www.ceramics.nist.gov/srd/scd/scdquery.htm**.

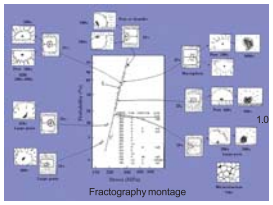
NIST Standard Reference Database 62

High Temperature Superconductors. Physical, mechanical, thermal, and superconducting properties; more than 30,000 numeric values. Available online at **http://www.ceramics.nist.gov/srd/hts/htsquery.htm**.

NIST Property Data Summaries

Focused studies with comprehensive property sets for specific materials and topical studies focused on one property for a wide range of materials. Available as follows:

- Alumina, **http://www.ceramics.nist.gov/srd/summary/scdaos.htm**
- Silicon Carbide, **http://www.ceramics.nist.gov/srd/summary/scdscs.htm**
- Titanium Diboride, **http://www.ceramics.nist.gov/srd/summary/scdtib2.htm**
- Yttrium Barium Copper Oxide, **http://www.ceramics.nist.gov/srd/summary/htsy123.htm**
- Elastic Moduli Data, **http://www.ceramics.nist.gov/srd/summary/emodox00.htm**
- Fracture Toughness Data, **http://www.ceramics.nist.gov/srd/summary/ftmain.htm**
- Fracture Data for Oxide Glasses, **http://www.ceramics.nist.gov/srd/summary/glsmain.htm**



Fractography

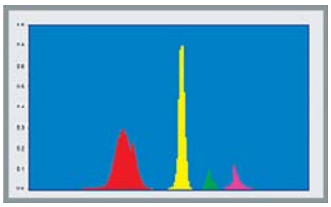
NIST principal investigator: G.D. Quinn

Characterization of Fracture Origins

Provides an efficient and consistent methodology to locate and characterize fracture origins in advanced ceramics. May be used in conjunction with ASTM standard C-1322. Available online at **http://www.ceramics.nist.gov/webbook/fracture/fracture.htm**.

STANDARD REFERENCE MATERIALS

SRMs produced by the Ceramics Division are available for purchase at **http://ts.nist.gov/ts/htdocs/230/232/232.htm**.



Particle Size Metrology SRMs

NIST principal investigator: J. Kelly

Standard Reference Material 1021

Glass Beads — Particle Size Distribution, a particle size standard for size range 2 µm to 12 µm.

Standard Reference Material 1003c

Glass Beads — Particle Size Distribution, a particle size standard for size range 20 µm to 50 µm.

Standard Reference Material 1004b

Glass Beads — Particle Size Distribution, a particle size standard for size range 40 µm to 150 µm.

Standard Reference Material 1017b

Glass Beads — Particle Size Distribution, a particle size standard for size range 100 µm to 400 µm.

Standard Reference Material 1018b

Glass Beads — Particle Size Distribution, a particle size standard for size range 220 µm to 750 µm.

Standard Reference Material 1019b

Glass Beads — Particle Size Distribution, a particle size standard for size range 750 µm to 2450 µm.

Standard Reference Material 659

Particle Size Distribution for Sedigraph Calibration, a particle size standard for size range 0.2 µm to 10 µm.

Standard Reference Material 8010

Sand for Sieve Analysis.

Standard Reference Material 1982

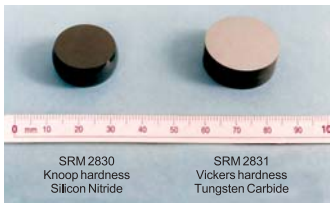
Zirconia Thermal Spray Powder — Particle Size Distribution, a particle size standard for size range 10 µm to 150 µm.

Standard Reference Material 1984

Thermal Spray Powder — Particle Size Distribution, Tungsten Carbide/Cobalt (Acicular), a particle size standard for size range 9 µm to 30 µm.

Standard Reference Material 1985

Thermal Spray Powder — Particle Size Distribution, Tungsten Carbide/Cobalt (Spheroidal), a particle size standard for size range 18 µm to 55 µm.



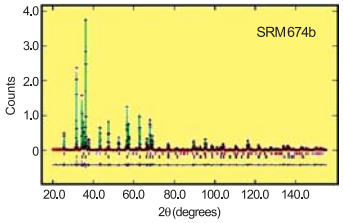
Mechanical Properties SRMs

NIST principal investigator: G.D. Quinn

Standard Reference Material 2830
Knoop Hardness of Ceramics.

Standard Reference Material 2831
Vickers Hardness of Ceramics and Hardmetals.

Standard Reference Material 2100
Fracture Toughness of Ceramics.



X-Ray Metrology SRMs

NIST principal investigator: J. Cline

Standard Reference Material 640c
Silicon Powder Line Position/Profile SRM, silicon powder, used for calibration of line position and characterization of the instrument profile function, certified with respect to lattice parameter.

Standard Reference Material 660a
LaB_6 Powder Line Position/Profile SRM, LaB_6 powder, used to characterize the instrument profile function and calibrate line position, certified with respect to lattice parameter.

Standard Reference Material 675
Mica Powder Line Position (Low Angle) SRM, synthetic fluorophlogopite mica powder, used to characterize the instrument line position at low two-theta angle, certified with respect to lattice parameter.

Standard Reference Material 1976a
Instrument Response, a sintered alumina plate, certified with respect to lattice parameter and diffraction intensity as a function of two-theta angle (texture), used for general calibration of diffraction equipment, with respect to line position and intensity, via conventional data analysis methods.

Standard Reference Material 676
Alumina Powder for Quantitative Analysis, high purity alumina powder for general quantitative analyses via powder diffraction methods, certified with respect to lattice parameter.

Standard Reference Material 1878a
Quantification of Alpha Quartz, respirable (5 µm) powders, certified with respect to amorphous content, used primarily by the industrial hygiene community for quantification of quartz in airborne dust.

Standard Reference Material 1879a
Quantification of Cristobalite, respirable (5 µm) powders, certified with respect to amorphous content, used primarily by the industrial hygiene community for quantification of cristobalite in airborne dust.

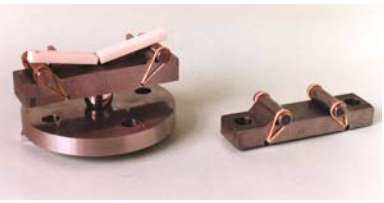
Standard Reference Material 674b
Quantitative Analyses, four powders, Cr_2O_3, CeO_2, TiO_2 and ZnO, allows the user to match the linear attenuation of the standard to that of the unknown, certified for phase purity using neutron time-of-flight diffraction. Supplemental information will include the reference intensity ratio (RIR) or I/Ic value and the lattice parameters as determined with conventional x-ray diffraction.

Standard Reference Material 656
Si_3N_4 Powder for Quantitative Analysis, two samples of high purity silicon nitride powder, one high in the alpha phase while the other is high in the beta phase, for quantitative analyses via powder diffraction methods, certified with respect to phase purity and the alpha to beta phase ratio.

Standard Reference Material 2910
Calcium Hydroxyapatite, calcium hydroxyapatite powder for use in evaluating calcium apatites, primarily in the field of biological research, certified with respect to lattice parameters and phase purity.

Standard Reference Material 1979
Crystallite Size/Line Broadening, CeO_2 and ZnO powder which exhibits diffraction line profile broadening due to crystallite size effects, certified with respect to particle size via XRD line profile analysis, applicable to a range of materials research and industrial interests concerned with crystallite size determination via powder diffraction techniques.

STANDARD TEST METHODS



Mechanical Property Test Methods

NIST principal investigator: G.D. Quinn

ASTM C 1161 (2002)
Standard Test Method for Flexural Strength of Advanced Ceramics at Ambient Temperature.

ASTM C 1322 (2002)
Standard Practice for Fractography and Characterization of Fracture Origins in Advanced Ceramics.

ASTM C 1326 (2003)
Standard Practice for Knoop Hardness of Advanced Ceramics.

ASTM C 1327 (2003)
Standard Practice for Vickers Hardness of Advanced Ceramics.

ASTM F 2094 (2001)
Standard Specification for Silicon Nitride Bearing Balls. This standard addresses the basic quality, physical and mechanical properties, and test requirements for silicon nitride balls used for ball bearings and other specialty applications.

ASTM C 1211 (2002)
Standard Test Method for Flexural Strength of Advanced Ceramics at Ambient Temperature.

ISO Standard 14704 (2000)
Fine Ceramics (Advanced Ceramics, Advanced Technical Ceramics) — Test Method for Flexural Strength of Monolithic Ceramics at Room Temperature.

ISO Standard 18756 (2003)
Fine Ceramics (Advanced Ceramics, Advanced Technical Ceramics) — Determination of Fracture Toughness of Monolithic Ceramics at Room Temperature by the Surface Crack in Flexure (SCF) Method.

ISO Standard 17565 (2004)
Fine Ceramics (Advanced Ceramics, Advanced Technical Ceramics) — Test Method for Flexural Strength of Monolithic Ceramics at Elevated Temperature.